1980 Suggested Fungicide Guide

Fungicide Guide for COMMERCIAL VEGETABLE GROWERS

VEGETABLE FUNGICIDE TOLERANCES AND INTERVALS approved by the Food and Drug Administration and the Environmental Protection Agency as of October 1, 1979, are presented in this publication. The tables on pages 2 and 3 give the tolerances in parts per million (ppm) and the number of days between the last application at normal rate and the harvest *or* they give the date of last application that will keep residues within tolerances set by the FDA.

The listing of a chemical for a crop does not necessarily constitute recommendation for control of a disease on that crop by the Illinois Cooperative Extension Service or the Agricultural Experiment Station. Specific recommendations are given on pages 4 to 7.

In some instances a tolerance (ppm) has been set but a definite interval has not been established. The absence of an interval does not necessarily mean that the fungicide may not be used on that crop. Use of the fungicide would require such restrictions as "do not apply after first blooms appear" or "do not apply after edible parts form."

In a few cases the interval and dosage have been established, but the allowable ppm residue has not been determined. Here again this does not mean that the fungicide may not be used on that crop. It does mean, however, that until a tolerance is established it must be considered to be zero. Zero tolerances are reviewed each year. Some are cancelled as the manufacturer supplies the EPA with additional data.

Growers must follow a disease control program that will assure the production of vegetables with no excessive fungicide residues. Vegetables marketed with residues exceeding FDA tolerances may be injurious to consumers, may be confiscated, and may cause the grower to be brought to court.

Growers have nothing to fear from the law so long as they use fungicides and other pesticides according to the current label only on the crops specified, in the amounts specified, and at the times specified. The safe grower keeps a record of the products and trade names used, the percentage of active ingredients, dilutions, rates of application per acre, and dates of application. The record sheet provided on page 8 is a convenient place to keep such information.

This circular is revised each year. Be sure you have the most up-to-date copy.

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UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN COLLEGE OF AGRICULTURE COOPERATIVE EXTENSION SERVICE
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FUNGICIDE USES FOR VEGETABLES, APPROVED BY THE EPA, OCTOBER 1, 1979[a, b]

Crop	Benlate, 0.2-15 ppm	Captan (D) (See ppm below)	Bravo, 0.1-15 ppm	Di-folatan, 0.1-15 ppm	Dyrene, 10 ppm	maneb, 4-10 ppm maneb with zinc salt	mancozeb[c] (See ppm below)	zineb, 4-25 ppm
Asparagus	..	root dip	..	..	..	A[d]	(0.1 ppm), A	A
Beans (dry, lima, snap)	14,[e] B (snap only)	(25 ppm), pp, 0[e]	7,[e] B (snap only)	..	..	0[e] 4 on limas or snap	..	7[e]
lima	28							
Beet, garden	..	(2 ppm-root, 100 ppm-greens), 0, pp	..	..	..	..	..	7(tops)
Broccoli	..	(2 ppm), pp	0[e]	..	..	(10 ppm), 3 or trim and wash	..	7
Brussels sprouts	..	(2 ppm), pp	0	..	..	7	..	..
Cabbage	..	(2 ppm), pp	0	..	..	(10 ppm), 7	..	7
Cantaloupe (muskmelon)	0	(25 ppm), 0, ph,[d] pp	0	0[e]	0[e]	5	(0 ppm in edible parts), 5[e]	5
Carrot	..	(2 ppm), 0	0	..	..	(7 ppm), 0	(2 ppm) 7, B (tops)	7(tops)
Cauliflower	..	(2 ppm), pp	0	..	..	0	..	7
Celery	(3 ppm), 7	(50 ppm), 0, pb	7	..	0	(5 ppm), strip and wash, 14	(5 ppm), 14	strip and wash, 14
Chinese cabbage	..	..	..	..	..	..	..	7
Corn, sweet and pop	..	(2 ppm), 10, B, pp	14, B[f]	..	..	..	(0.5 ppm-cob and kernel), 7 (5 ppm-fodder and forage, 0.5 ppm-ears)	0, B, C
Cucumber	(1 ppm), 0	(25 ppm), 0, ph, pp	0	0	0	(4 ppm), 5	(4 ppm), 7	5
Eggplant	..	(25 ppm), 0, ph, pb	..	..	..	0	..	0
Endive, escarole	..	..	..	..	..	(10 ppm), 7 and wash	..	10
Fennel	..	..	..	..	..	..	7	..
Kale, collard	..	(2 ppm), pp	..	..	..	(10 ppm), 10 and wash	..	10
Kohlrabi	..	..	..	..	..	0	..	(halfgrown)
Lettuce	..	(100 ppm), 0	..	..	..	(10 ppm), 7 (strip and wash)	..	10
Mustard greens	..	(2 ppm), pp	..	..	..	(10 ppm), 10 and wash	..	10
Onion	..	(50 ppm green, 25 dry), 0, ph	0	0	0	(7 ppm), 0	(0.5 ppm dry), 7, D	10
Peas	..	(2 ppm), pp	..	..	..	..	..	10, C
Pepper	..	(25 ppm), 0, pb, pp	..	..	..	(7 ppm), 0	E	0
Potato, Irish[d]	..	(25 ppm), 0, ph	0	0	0	(0.1 ppm), 0, C	(1.0 ppm), 0	0 and seed, C, pp
Pumpkin	..	(25 ppm), 0, pp	0	..	0	(7 ppm), 0	..	0
Radish	..	..	..	..	0	..	..	0
Rhubarb (greenhouse)	..	(25 ppm), 0	..	..	..	(10 ppm), 0	..	..
Spinach	..	(100 ppm), 0, pp	..	..	..	7 and wash	..	10
Squash	(1 ppm), 0	(25 ppm), 0, pp	0	..	0	(7 ppm), 5	(4 ppm), 5	5
Sugar beet[d]	(0.2 ppm-roots, 15 ppm-tops), 21	0	..	..	..	10, B, C, 14, no feeding restrictions	(2 ppm-roots, 65 ppm-tops), B, 14	..
Swiss chard	..	0	..	..	..	..	..	10
Tomato	(5 ppm), 0	(25 ppm), 0, pp	0	0[g]	0	(4 ppm), 5, F	(4 ppm), 5	5
Turnip, rutabaga	..	(2 ppm), pp	..	..	..	10 and wash	..	(7 ppm), 7-tops
Watermelon	(1 ppm), 0	(25 ppm), 0, pp	0	0	0	5	(0 ppm edible parts), 5[e]	5

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[a] No tolerances have been set for these fungicides on dill, horseradish, okra, parsley, and parsnip.

[b] The following abbreviations are used:
A = Post-harvest application to ferns only or to young plantings that will not be harvested.
B = Do not feed treated tops or forage to livestock.
C = Do not use treated seed or seed pieces for feed or food.
D = Do not apply to exposed bulbs.
E = Do not apply after fruit buds form.
F = To avoid damage, do not use on tender young plants.
pb = Plant bed treatment.
ph = Post-harvest spray or dip.
pp = Preplant soil treatment.

[c] Mancozeb is sold as Dithane M-45 and Manzate 200.

[d] Tolerances are not needed for pesticides applied only to the foliage and not translocated to the tubers or roots.

[e] Number indicates number of days between last application and harvest; 0 = up to harvest.

[f] Do not apply if crop is to be used for processing.

[g] Machine harvest only.

LABEL INFORMATION ON FUNGICIDES OF LESS GENERAL USE

Fungicide (tolerance)	Crops and use restrictions
Botran	**Beans** (snap) — white mold, 2 days to harvest. Do not feed forage to livestock. **Greenhouse tomato** — to harvest. Do not drench seedlings or newly set transplants. **Carrot** — post-harvest dip or spray, see label. **Garlic, Onion** — soil application before seeding or spray to soil around sets or bulbs. *Do not plant spinach* as follow-up crop in treated soil. **Leaf lettuce** (greenhouse) — 14 days[a] (do not apply to wilted plants or seedlings). **Head lettuce** — 14 days. **Celery** — 7 days. **Cucumber** (greenhouse) — see label. **Rhubarb** (greenhouse) — 3 days. **Potato** — 14 days (do *not* feed to livestock). **Sweet potato** — root dip and plant bed treatment. **Note:** Do not plant tomatoes as followup in treated soil. Don't use spent roots for food or feed. Post-harvest spray or dip as directed.
Copper fungicides[b] tribasic copper sulfate (Kobasic, Triangle, Tri-basic Copper Sulfate, etc.)	**Bean, beet, broccoli, cabbage, cantaloupe, carrot, cauliflower, celery, cucumber, eggplant, honeydew melon, lettuce, muskmelon, onion, pea, potato, pumpkin, radish, spinach, squash, tomato, watermelon.**
copper sulfate (many)	**Bean, broccoli, cabbage, cantaloupe, cassaba melon, cauliflower, celery, cucumber, honeydew melon, muskmelon, Persian melon, potato, pumpkin, radish, squash, tomato, watermelon.**
copper resinate (Citcop 4E, Cop-O-Cide, Emulsifiable Liquid Copper Fungicide)	**Bean, cantaloupe, cauliflower, chinese cabbage, cucumber, honeydew melon, lettuce, onion, pepper, pumpkin, squash, tomato, turnip, watermelon.**
copper ammonium carbonate (Copper-Count N)	**Bean, cabbage, carrot, crenshaw melon, celery, cantaloupe, cassaba melon, cucumber, honeydew melon, lettuce, muskmelon, pepper, Persian melon, potato, squash, tomato, watermelon.**
copper hydroxide (Kocide 101 and 404)	**Bean, cantaloupe, carrot, celery, cucumber, honeydew melon, muskmelon, pepper, potato, pumpkin, squash, tomato, watermelon.**
copper oxychloride sulfate (COCS, Copro 50 and 53)	**Bean, beet, broccoli, cabbage, cantaloupe, carrot, cassaba melon, cauliflower, celery, crenshaw melon, cucumber, eggplant, honeydew melon, lettuce, muskmelon, onion, pea, Persian melon, potato, pumpkin, spinach, squash, tomato, watermelon.**
bordeaux mixture (Acme Bordeaux mixture, Pattersons Bordeaux mixture, Bor-Dox, Ortho Bordo mixture, etc.)	**Cress, cucumber, eggplant, honeydew melon, muskmelon, Persian melon, potato, pumpkin, radish, squash, tomato, turnip, watermelon.**
fenaminosulf (Lesan)	Cleared *only* for seed-treatment use on **beans, beets, corn, cucumbers, peas, spinach, sugar beets.** Do not use treated seed for food, feed, or oil. Slurry seed treatment for planting in light soils or soils high in clay or organic matter.
dinocap (Karathane)	**Cantaloupe** (**muskmelon**), **cucumber, honeydew melon, pumpkin, squash, watermelon** — 7 days. For control of powdery mildew only.
etridiazole (Terrazole, Truban)	Seed treatment: **Beans, peas, sugar beets.**
polyethylene polymer (Polyram) (0 ppm)	**Potato, sugar beet** — no time limitations. **Celery** — 14 days. **Cantaloupe, cucumber, tomato** — 5 days. Do *not* feed **sugar beet** tops to meat or dairy animals. **Celery** — strip, trim, and wash. Post-harvest application to **asparagus ferns.**
PCNB (Terraclor, Brassicol, Fungiclor) (0.1 ppm)	**Beans** — base of plants *before* blossoming, soil and seed treatment at planting, or foliar spray. Do *not* feed treated **Bean** vines to livestock. Do *not* apply after first bloom. **Broccoli, brussels sprouts, cabbage, cauliflower** — transplant solution (¾ pint per plant) or row treatment before transplanting. **Pepper, potato, tomato** — soil treatment at or before planting. **Tomato** (field use only) — transplant solution (½ pt. of 0.2% per plant). **Garlic** — soil and seed treatment at planting.
streptomycin (0.25 ppm)	**Celery, pepper, tomato** — plant beds only (200 ppm spray); **Potato** — **seed-piece treatment only** (**100 ppm dip or** dust). Soak cut seed pieces less than 30 min. **Beans** — seed treatment for halo blight control. Do not use treated seed for food or feed.
sulfur, lime, and lime-sulfur	Exempt when used with good agricultural practices. See label.
thiabendazole (Mertect)	**Sweet potato** — "seed" root treatment. Do not use treated pieces for food or feed. **Potato** — "seed" tubers only (1,500 ppm-20 sec. dip.
thiram, TMTD (0.5-7 ppm)	**Onion** — Furrow treatment. **Celery** — 7 days (strip, trim, and wash). **Sweet potato** — preplant root dip. **Tomato** — 0 days, for leaf spots and fruit rots. Seed treatment: **Beans, beets, broccoli, brussels sprouts, cabbage, cantaloupe, carrot, cauliflower, collard, corn, cucumber, eggplant, endive, kale, kohlrabi, lettuce, okra, onion** (bulb, seed, and set), **peas, pepper, pumpkin, radish, spinach, squash, swiss chard, tomato, turnip, watermelon.** WARNING: Do not use treated seed for food, feed, or oil.
triphenyltin (Du-Ter)	**Potato** — early and late blight. May be applied through irrigation systems (solid set or center pivot only).

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[a] Number of days between last application and harvest.

[b] There are many other copper materials, but these are most widely available and labeled for use on vegetable crops. Exempt from tolerance if used with good agricultural practices; not exempt if used at time of or after harvest. See label.

CONDENSED FUNGICIDE RECOMMENDATIONS FOR DISEASES OF COMMERCIAL VEGETABLE CROPS FOR 1980

Vegetable	Diseases	Fungicide[a]	Remarks
Asparagus	Rust (RPD 934)[b], leaf and branchlet blights	zineb, maneb, mancozeb, or Polyram	Apply to non-harvested fields *throughout* season to August 15; to harvested fields *after* cutting only. Apply at 7- to 10-day intervals. May combine with insecticides to control asparagus beetles, cutworms, etc. (Cir. 897).[b] Polyram on ferns only.
	Root rots	mancozeb, captan	Use as a preplant dip.
Beans (garden, wax, and lima)	Seed decay (RPD 915), damping-off, and seed-borne stem blights and root rots	thiram, captan, Terrazole, or chloroneb plus insecticide	Treat seed any time if not previously treated by producer. Plant *only certified*, western-grown seed in warm soil above 65° F.
	Bacterial blights	fixed copper (2-3 lb. metallic/A.)	Apply at weekly intervals. Plant *only certified* western-grown seed.
	Rust, anthracnose, fungus leaf spots, pod and stem spots	maneb, zineb, or Bravo	Apply at 7- to 10-day intervals during moist weather. Combine with insecticides to control bean beetles, aphids, leafhoppers, blister beetles, etc. (Cir. 897).
	Mosaics		Use insecticides to control aphids (NHE-47)[b] that transmit the viruses. Kill aphids *before* they feed (Cir. 897). Control weeds in and around fields (Cir. 907).
	White mold	Botran, PCNB, benomyl	Apply to base of plants just before bloom, or at 25-50% bloom (benomyl). Do not feed treated vines to livestock.
Beets (garden and sugar), Spinach, Swiss chard	Seed rot (RPD 915), damping-off, and seed-borne leaf spot and anthracnose	thiram or captan	Treat seed any time or buy treated seed. To control damping-off apply captan (5-7 lb. of 50% WP in 25-30 gal. water/A. or 25-30 lb. of 10% dust/A.) in furrow at planting time.
	Cercospora leaf spot (RPD 951), downy mildew	zineb or fixed copper (2-3 lb. metallic/A.)	Apply every 1 to 2 weeks during rainy periods. May combine with insecticides to control aphids, leafhoppers, caterpillars, leaf miners, etc. (Cir. 897).
	Mosaics, virus yellows		Use insecticides to control aphids (NHE-47) and plant bugs that transmit the viruses. Kill insects before they feed (Cir. 897).
Broccoli, Brussels sprouts, Cauliflower, Cabbage, Chinese cabbage, Collard, Mustard, Kale, Kohlrabi, Radish, Rutabaga	Seed rot (RPD 915), damping-off, black rot (RPD 924), blackleg (RPD 955), radish black root (RPD 948), Alternaria blight	hot water, then thiram or captan	Buy western-grown seed. Sow *only* seed treated with hot water. Control cabbage root maggots, cutworms, cabbage worms, etc. (Cir. 897). Four-year rotation with non-crucifer crops.
	Wirestem (*Rhizoctonia*) (RPD 902), damping-off, seed rot (RPD 916), Botrytis blight (RPD 942)	PCNB-captan mixture	Dust or spray on soil just before, at, or after planting seed. Follow manufacturer's directions.
	Clubroot (RPD 923)	PCNB 75	Apply in transplant water or starter solution, ¾ pt. per plant (about 400 to 600 gal./A.). Do *not* use emulsion form of PCNB.
	Downy mildew, leaf spots, white rust (RPD 960), anthracnose, Botrytis blight (RPD 942)	maneb, zineb, or Bravo	Apply at 5- to 7-day intervals (3-5 days for radish) in wet weather. Use maneb in seedbed(2 lb./100 gal.). Good coverage important. May need spreader-sticker. May combine with insecticides to control aphids, cabbage worms, etc. (Cir. 897).
	Mosaics, black ringspot		Use insecticides to control aphids (NHE-47) and cabbage worms (NHE-45) that transmit the viruses. Kill insects *before* they feed — especially in seedbeds (Cir. 897).
	Brittle root (primarily horseradish)		Use insecticides to control leafhoppers that transmit the virus (Cir. 897). Apply when leafhoppers are *first* noticed. Additional applications may be necessary if infestation is severe.
Horseradish	Leaf spots	fixed copper	
Carrot, Parsnip	Seed rot (RPD 915), damping-off	thiram or captan	Treat seed any time. May combine with insecticides.
	Aster yellows (RPD 903)		Use insecticides to kill leafhoppers that transmit the mycoplasma, *before* they feed (Cir. 897). Begin when plants are 2-3 inches tall; apply weekly for 4 weeks. Control weeds in and around plantings (Cir. 907).
	Cercospora leaf spot, Alternaria leaf blight (RPD 938)	captan, maneb, mancozeb, zineb, or Bravo	Apply at 5- to 10-day intervals in rainy periods. Thorough coverage essential. Start around June 15.

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[a] Dosages: The quantity of material listed is the pounds of active (actual) ingredient to be applied to 1 acre unless stated otherwise (i.e., 3 lb./A.; 2 lb. 50% WP; 20 lb. 5% dust). Abbreviations used: A = acre; WP = wettable powder; pt. = pint(s); gal. = gallon(s); T. = tablespoon(s) (level); sq. ft. = square foot or feet.

[b] RPD = Report on Plant Diseases; NHE = Natural History Entomology publication. General references: Circular 897, 1980 Insect Pest Management Guide — Commercial Vegetable Crops and Greenhouse Vegetables; and Circular 907, 1980 Herbicide Guide for Commercial Vegetable Growers. Materials available from the County Cooperative Extension Service Offices.

CONDENSED FUNGICIDE RECOMMENDATIONS (continued)

Vegetable	Diseases	Fungicide	Remarks
Celery, Parsley	Seed rot (RPD 915), damping-off, seed-borne blights	hot water, then thiram or captan	Treat seed just before planting or buy treated seed. If damping-off starts, spray plants and soil 2 to 3 times, 5-7 days apart. Use zineb (1 T./gal.). Three-year-old seed is free of late blight.
	Leaf blights and leaf spots	maneb, zineb, benomyl, Dyrene, Bravo, mancozeb	Apply every 7-10 days in field except during very dry weather.
	Mosaics, calico, ringspot		Use insecticides to control aphids (NHE-47) that transmit the viruses. Kill aphids *before* they feed (Cir. 897). Control weeds in and around plantings (Cir. 907).
	Aster yellows (RPD 903)		Use insecticides to control leafhoppers that transmit the mycoplasma. Kill insects *before* they feed. Control weeds in and around plantings (Cir. 907).
Corn (sweet and pop)	Seed rot (RPD 915), seedling blights, seed-borne root and stalk rots, leaf blights	Captan, zineb, Vitavax-thiram, or thiram *plus* insecticide	Treat seed any time or buy seed treated with both a fungicide and an insecticide (NHE-27).
	Bacterial wilt (RPD 907)		Apply insecticides over row to control flea beetles (NHE-36) that transmit the wilt bacteria (Cir. 897). One to 6 sprays may be needed, 3 to 5 days apart. Start the day *before* corn comes up.
	Helminthosporium leaf blights	mancozeb, Polyram, or Bravo	Begin when disease first appears. Repeat at 7-day intervals or as required.
	Rust	zineb	Same as above.
Cucumber, Muskmelon (Cantaloupe), Pumpkin, Squash, Watermelon	Seed rot (RPD 915), damping-off, angular and Alternaria leaf spots, Fusarium wilt, gummy stem blight or black rot, anthracnose, scab	captan, or thiram *plus* insecticide	Sow *only* certified, western-grown seed. Watering after planting with captan 50W (2 lb./100 gal. at 1 gal./125 sq. ft., every 5-7 days) controls damping-off. May combine with insecticides (Cir. 897) to control seed-corn maggots (NHE-27) in seedbed. Use 3- to 4-year rotation.
	Bacterial wilt (RPD 905)		Use insecticides to control cucumber beetles (NHE-46) that transmit the causal bacteria. Kill beetles *before* they feed (Cir. 897). Applications needed from young seedlings to mature plants. Thorough coverage is essential.
	Anthracnose (RPD 920), downy mildew (RPD 927), scab (RPD 928), blossom blight, leaf spots and blights (RPD 918), fruit spots and rots, gummy stem blight or black rot	maneb, mancozeb, zineb, Bravo, Difolatan, Dyrene, or benomyl	Use captan or ziram (2-3 lb./100 gal.) on young plants. Apply at 7- to 10-day intervals from seedling emergence to vining. Start other materials *after* vines begin to run. Repeat at 5- to 10-day intervals to 7-10 days before harvest; keep new growth protected. May combine with insecticides to control cucumber beetles, aphids, vine borer, pickle worm, etc. (Cir. 897).
	Angular leaf spot (RPD 919)	fixed copper (2-3 lb. metallic/A.) or soluble copper	Apply at 5- to 7-day intervals in warm, wet weather; or mix with zineb or maneb (2 lb./A.). Begin when plants start to vine or disease *first* appears.
	Mosaics (RPD 926)		Use insecticides to control aphids (NHE-47) and beetles (NHE-46) that transmit the viruses (Cir. 897). Kill insects *before* they feed. Control weeds (Cir. 907).
	Powdery mildew (RPD 925)	Karathane WD, benomyl (8 oz./100 gal.), Bravo *plus* spreader-sticker	Dust or spray. Thorough coverage essential. Repeat 5-10 days later. Do not apply within 7 days of harvest. Use benomyl alone.
Eggplant	Seed rot (RPD 915), seed-borne anthracnose, Phomopsis blight (RPD 949), and Verticillium wilt (RPD 950)	hot water, then thiram or captan	Treat seed just before planting.
	Damping-off (RPD 916)	captan	Seedbed or flat spray, 5 gal./100 sq. ft. Repeat at 5- to 7-day intervals.
	Blight (Phomopsis, Alternaria, Cercospora) (RPD 949), anthracnose	maneb, zineb, or captan	Start when disease is first evident, *or* when first fruits are half mature. Repeat at 7- to 10-day intervals. *Do not use copper fungicides on eggplant.* May combine with insecticides (Cir. 897).
Lettuce, Endive	Seed rot (RPD 915), damping-off (RPD 916), gray mold (RPD 942)	thiram, Botran, ferbam, zineb	Dust seed lightly with captan 75. Then apply Botran as dust or spray just before or just after seeding. For *field use only.*
	Aster yellows (RPD 903), white heart		Use insecticides to control leafhoppers that transmit the mycoplasma. Kill leafhoppers *before* they feed (Cir. 897). Applications needed throughout season. Dust or spray weed borders.
	Mosaics (RPD 946)		Use insecticides to control aphids (NHE-47) that transmit the viruses. Kill aphids *before* they feed (Cir. 897). Sow *only* mosaic-indexed seed. Control weeds in and around plant-growing areas (Cir. 907). Keep new and old beds as far apart as possible.

CONDENSED FUNGICIDE RECOMMENDATIONS (continued)

Vegetable	Diseases	Fungicide	Remarks
	Gray mold (RPD 942), downy mildew, other fungus leaf spots, white rust Sclerotinia	ferbam, maneb, or zineb Botran Botran or ferbam	Apply at 5- to 7-day intervals in cool, damp weather. Do not apply within 10 days of harvest. May combine with insecticides to control aphids, leafhoppers, flea beetles, etc. (Cir. 897). Botrytis control. Do not apply within 14 days of harvest.
Okra	Seed rot (RPD 915), damping-off	thiram	Seed treatment. Apply any time.
Onion, Garlic	Smut (RPD 933), seed decay (RPD 915), damping-off, seed-borne purple blotch	thiram or captan	Apply to seed any time (RPD 933). For *onion sets*, use 1 lb. (100% active) to 20 lb. seed; for *bulb onions*, wet seed with Methocel sticker then treat with 8 lb. thiram 75 or captan 75 to 8 lb. seed. For *pickling and green bunching onions*, same as for bulb onions; but use half dosage. Control seed- and bulb-feeding insects (Cir. 897).
	Blast (RPD 931), downy mildew, purple blotch, gray mold blight (RPD 942), neck rot (RPD 930)	maneb, Difolatan, Bravo 6F, Dyrene, mancozeb, or zineb *plus* spreader-sticker	Apply every 5 to 7 days in moist weather. May combine with insecticides to control thrips, onion maggots, cutworms, etc. (Cir. 897).
	Yellow dwarf, mosaics		Use insecticides to control aphids (NHE-47) that transmit the viruses. Kill aphids *before* they feed (Cir. 897). Keep new and old plantings *as far apart* as possible.
Pea, Lentil	Seed decay (RPD 915), damping-off, seed-borne foot rots, Ascochyta and Mycosphaerella blights (RPD 945), Fusarium wilts (RPD 912), and bacterial blights	fenaminosulf, thiram, captan, or zineb *plus* insecticide	Treat seed any time or buy seed treated with fungicide-insecticide. Sow certified, western-grown seed. Where captan or thiram are used, friction may reduce seeding rate; add graphite (1 oz./bu.).
	Root rot	dinoseb (Premerge 3)	Apply preplant incorporated, according to the label. Applications of trifluralin for weed control may also provide some control of root rot.
	Leaf and stem spots or blights (RPD 945)	zineb	Apply weekly in rainy weather where diseases have been severe in past.
	Powdery mildew	lime-sulfur dust (4-6 ratio) 30 lb./A.	Do not apply at air temperature above 80° F. or when plants are in flower. Two applications, a week apart, when mildew *first* appears, should be sufficient.
Peanut	Seed rot (RPD 915), seedling blights	Botran, thiram, Difolatan, or captan	Treat seed anytime. Do not use treated seed for food, feed, or oil.
Potato, Irish	Seed-piece decays (RPD 915), and seed-borne Verticillium wilt (RPD 950)	captan, maneb, Polyram, zineb, or mancozeb	Apply as dust or dip to cut and uncut tubers. Follow manufacturer's directions. Tubers should be well corked over. Plant in warm (over 50° F.) soil.
	Blackleg (RPD 943)	streptomycin	May combine with treatment for seed-piece decays. Use uncut, B-size, certified seed.
	Early blight (RPD 935), late blight (RPD 936), and minor leaf spots and blights	maneb, mancozeb, Difolatan, Bravo, Polyram, Dyrene, Du-Ter	Apply at 4- to 10-day intervals. If rainy, shorten interval; if dry, lengthen. For "finish-up" sprays use fixed copper (3 lb. metallic/A.). May combine with insecticides (Cir. 897).
	Common scab (RPD 909), and black scurf (*Rhizoctonia*)	PCNB(various formulations)	May help on *mineral* soils. Work into top 4-6 inches of soil at or before planting. Follow manufacturer's directions carefully. Dust seed pieces with difolatan or mancozeb.
	Mosaics, leafroll, mottle, purple-top, yellow dwarf, etc.		Use insecticides to control aphids (NHE-47), leafhoppers (NHE-22), etc., that transmit the viruses. Kill insects *before* they feed (Cir. 897).
	Nematodes	Aldicarb (Temik)	Use where soil tests indicate damaging populations of nematodes.
Rhubarb	Root and crown rots	fixed copper (3 lb. metallic/A.)	Drench crowns early in spring and after harvest. Plant *only* in *well-drained* soil.
	Leaf and stalk spots, anthracnose	captan, Botran	Avoid applications from 2 weeks before harvest until cutting is completed (greenhouse only). May combine with insecticides (Cir. 897).
Sweet potato	Black rot (RPD 953), foot rot (RPD 958), Fusarium wilt (RPD 954,) scurf (RPD 957)	Botran thiram (1½oz./gal.), thiabendazole	Seed dip or bed spray. Dip disease-free roots or sprouts just before planting. Follow manufacturer's directions. Seedbed disinfestation (Cir. 893). Three to 4-year rotation. Strict sanitation. Do not rinse after treatment.
	Storage rots (RPD 952)	Botran (as post-harvest dip or in wash water)	Helps reduce transit and market losses caused by Rhizopus soft rot and black rot. Fumigate storage houses with formaldehyde.

CONDENSED FUNGICIDE RECOMMENDATIONS (concluded)

Vegetable	Diseases	Fungicide	Remarks
Tomato, Pepper	Seed decay (RPD 915), seed-borne bacterial spot (RPD 910), speck and canker (RPD 962), early blight (RPD 908), Septoria blight, anthracnose, Fusarium wilt (RPD 929), leaf mold (RPD 941)	hot water, then captan, or thiram	Treat seed, buy treated seed, or certified, disease-free transplants (Cir. 912).
	Bacterial spot (RPD 910)	fixed copper-streptomycin mixture	Start when seedlings emerge and apply every 5 days. In *field*, use fixed copper (2-3 lb. metallic/A.) plus maneb or mancozeb (2 lb./A.).
	Damping-off (RPD 916) and seedling blights, collar rot (RPD 908)	captan, ferbam	Dust or spray in seedbed. Apply as plants emerge so spray runs down stems. Repeat every 4 to 7 days until 10 days before transplanting. Follow the manufacturer's directions.
	Septoria blight (RPD 908), early blight, anthracnose, late blight (RPD 913) and buckeye rot, gray leaf spot, leaf mold (RPD 941)	maneb, mancozeb, Polyram, zineb, Difolatan, Dyrene, Bravo benomyl	Apply every 7 to 10 days *after* first fruit clusters form. Five or more sprays may be necessary, depending on weather. Combine with insecticides to control flea beetles, climbing cutworms, hornworms, fruit flies, etc. (Cir. 897). *Soil surface spray of maneb or Difolatan after last cultivation improves anthracnose control.* Tomato leaf mold and Botrytis control.
	Mosaics (RPD 917)		Use insecticides to control aphids (NHE-47) and beetles that transmit the viruses. Kill insects *before* they feed (Cir. 897). Control weeds in and around plant-growing area (Cir. 907). Set out certified, virus-free transplants and start with virus-free seed.
	Blossom-end rot (RPD 906)	calcium nitrate (4-6 lb./A.)	Application of 4 or more consecutive sprays in the regular schedule may reduce losses. Start when fruits are the size of grapes. Irrigate to maintain uniform soil moisture.
	Cloudy spot (RPD 914)		Use insecticides to control stink bugs that produce cloudy spot by feeding punctures (Cir. 897).
(General diseases that attack most vegetable crops)	Damping-off (RPD 916) and seedlings blights; gray mold (RPD 942) or Botrytis blight	After planting apply captan, thiram, or zineb (1 T./gal.); ferbam or ziram (2 T./gal.)	Disinfest seedbed soil (Cir. 893), then apply seed treatment (RPD 915). Then apply sprays or drenches after planting. Apply *only* if damping-off appears in seedbed and when seedlings need water. (*For crucifers, pepper, peas, beans, tomato, lettuce*, add PCNB to other fungicides to give broad-spectrum control.) Use at least 5 gal. per 1,000 sq. ft. of bed. Repeat at 5- to 7-day intervals when temperature is below 75° F.
	Root knot and other nematodes; Fusarium wilts of various crops (RPD 901,904,912,929, 954)	Heat or chemicals may be used. Consult RPD 1002 for names, general precautions, and directions	Disinfest seedbed soil (heat preferred, if available). Follow manufacturer's directions exactly. Fumigants work best in light, loose soils, free of trash, clods, and lumps. Avoid recontamination of treated soil. Best to apply fumigants during the fall that precedes planting. In general, soils must be at least 55° F. at the 6-inch depth with a time lapse of 21-28 days between treating and seeding. Some require gas-tight plastic covers.
	Root and stem or crown rots of various crops (RPD 902,911,922,923, 932,948,953)		*Plant resistant varieties when available.*
	Verticillium wilt (RPD 950)		

GENERAL SUGGESTIONS ON FUNGICIDE APPLICATION

1. Cover the foliage uniformly. *Ground equipment* — Apply 75 to 125 gallons per acre at approximately 400 pounds per uare inch of pressure. Lower volumes and/or pressures may provide adequate coverage, but high-volume, high-pressure applicaons provide ideal coverage. Make sure the sprayer is functioning properly. Check the nozzles for cleanliness and wear. Boom, eight, accuracy of pressure gauge, agitation, and calibration should also be checked. *Aerial application* — Apply recommended mounts of pesticide per acre in 3 to 5 gallons of water. Make sure nozzles are properly aligned and clean, so uniform applicaon is achieved. Cover a swath no wider than is reasonable for the aircraft and boom being used. Spray only those fields which re suitable for aerial application. Avoid fields of irregular shape or topography, particularly if they are bounded by power lines, ees, or other obstructions.

2. Whenever possible spray when the air is still or when wind velocity is not excessive (less than 10 to 12 mph).

3. Avoid situations where pesticide drift may cause needless problems.

4. When it is compatible with the product label, use a spray adjuvant (surfactant). Some commonly available surfactants re: Colloidal Products X77 (liquid, non-ionic) spreader activator; Colloidal Products Multifilm L. (liquid); Colloidal Products pray Modifier (liquid, non-ionic) spreader sticker; Millers Nufilm 17 liquid spreader sticker; Millers Nufilm P liquid spreader icker; Allied Chemical Plyac (liquid) sticker; Rohm and Haas Triton B — 1956 (liquid, non-ionic) spreader sticker; Triton S7, spreader-binder; and Du Pont Spreader Sticker (liquid) spreader sticker.

RECORD SHEET FOR FUNGICIDE USERS

Date	Vegetable	Chemical	Dosage per acre	Remarks